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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/577,238	05/23/2000	Ying-wai Ho	103-1	3622

7590 08/18/2003
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EXAMINER

DO, CHAT C

ART UNIT	PAPER NUMBER
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2124

DATE MAILED: 08/18/2003

19

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application No.

09/577,238

Applicant(s)

HO ET AL.

Examiner

Chat C. Do

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 3,4,16-19,21,26 and 29 is/are allowed.
- 6) ☒ Claim(s) 1,2,5-9,11-15,20,22-25,27,28 and 30-32 is/are rejected.
- 7) ☒ Claim(s) 10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 12,13.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

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DETAILED ACTION

1. This communication is responsive to Amendment A, filed 6/23/2003.
2. Claims 1-32 are pending in this application. Claims 1, 9, 13, 16, 20, 23, 27, and 30-32 are independent claims. This action is made final.

Response to Amendment

3. The amendment filed 6/23/2003 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: the amended limitations in claim 7 as "wherein the operand flush section ... the plurality of ranges of values". The specification does not disclose the operand flush section uses a number of MSB of exponent to determine whether the preliminary result falls within the plurality of ranges of values.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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5. Claims 1-2, 5-7, 20, 22-24, 27-28, and 30-32 are rejected under 35 U.S.C. 102(b) as being anticipated by Hirose et al. (U.S. 4,839,846).

Re claim 1, Hirose et al. disclose a floating-point unit configurable to perform floating-point operations in Figures 7-8. The floating-point unit comprises an operand processing section operative to, for each floating-point operation, receive and process one or more input operands (60) to provide a preliminary result (70) comprised of a mantissa and an exponent (col. 4 lines 10-20); and an operand flush section coupled to the operand processing section (80) and operative to determine whether the preliminary result falls within one of a plurality of ranges of values (based on the least significant bits in figure 4a) between zero and a minimum normalized floating-point number (a last number that can be stored in the register), and set the preliminary result to one of a plurality of set values if the preliminary result falls within one of the plurality of ranges of values (col. 2 lines 35-48).

Re claim 2, Hirose et al. further disclose in the operand flush section is operative to set the preliminary result to one of two set values if it falls within one of two ranges of values (col. 2 lines 35-48) between zero and minimum normalized floating-point number.

Re claim 5, Hirose et al. further disclose in Figures 4a and 7 the plurality of ranges (based on the least significant bits in Figure 4a) are selected such that a determination of whether the preliminary result falls within one of the plurality of ranges of values can be performed by checking an exponent of the preliminary result (col. 2 lines 4-13).

Re claim 6, Hirose et al. further disclose the plurality of ranges are defined by a one or more of threshold values that are related by factors of two (Figures 4a).

Re claim 7, Hirose et al. further disclose in Figure 4a the plurality of ranges wherein cover denormalized floating-point numbers between zero and a minimum normalized floating-point number, a_{min} .

Re claim 20, it is a processor claim of claim 1 which including an instruction unit and memory unit for storing the instructions. Thus, claim 20 is also rejected under the same rationale in the rejected claim 1.

Re claim 22, it is a processor claim of claim 5. Thus, claim 22 is also rejected under the same rationale in the rejected claim 5.

Re claim 23, it is the method claim of claim 1. Thus, claim 23 is also rejected under the same rationale in the rejected claim 1.

Re claim 24, it is the method claim of claim 5. Thus, claim 24 is also rejected under the same rationale in the rejected claim 5.

Re claim 27, it is the program claim of claim 1. Thus, claim 27 is also rejected under the same rationale in the rejected claim 1.

Re claim 28, it is the program claim of claim 5. Thus, claim 28 is also rejected under the same rationale in the rejected claim 5.

Re claim 30, it is the article of manufacture claim of claim 1 which includes the computer readable program code. Thus, claim 30 is also rejected under the same rationale in the rejected claim 1.

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Re claim 31, it is the article of manufacture claim of claim 1 which includes the computer readable program code. Thus, claim 31 is also rejected under the same rationale in the rejected claim 1.

Re claim 32, it is the article of manufacture claim of claim 1 which includes the computer readable program code. Thus, claim 32 is also rejected under the same rationale in the rejected claim 1.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being obvious over Hirose et al. (U.S. 4,839,846).

Re claim 8, Hirose et al. do not disclose the floating-point unit can be used to perform a reciprocal operation. Official Notice is taken that performing reciprocal operation in a floating-point unit such as Hirose's was well known in the art at the time the instant invention was made. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to use the disclosed floating-point unit to perform a reciprocal operation because it would enable the operator to perform the reversed operation.

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8. Claims 9, 11-15 and 25 are rejected under 35 U.S.C. 103(a) as being obvious over Hirose et al. (U.S. 4,839,846) in view of Mansingh (U.S. 6,199,089).

Re claim 9, Hirose et al. disclose a floating-point unit configurable to perform floating-point operations in Figures 4a-4d and 7. The floating-point unit comprises a mantissa processing section operative to, for each floating-point operation, receive and process one or more mantissas (60) for one or more input operands to provide a preliminary result mantissa, set the preliminary result mantissa to a first mantissa value if a result of a floating-point operation is within a first range of values, and set the preliminary result mantissa to a second mantissa value if the result is within a second range of values (Figures 4a-4d wherein the ranges for round-off are 0000-0100 and 1000-1011 and the ranges for round-up are 0101-0111 and 1100-1111 in the round to nearest mode). Hirose et al do not disclose an exponent processing section coupled to the mantissa processing unit and operative to receive and process one or more exponents for the one or more input operands to provide a preliminary result exponent, set the preliminary result exponent to a first exponent value if the result is within the first range of values, and set the preliminary result exponent to a second exponent value if the result is within the second range of values. However, Mansingh discloses in Figure 3A an exponent processing section (206) coupled to the mantissa processing unit (214) and operative to receive and process one or more exponents (202 and 204) for the one or more input operands to provide a preliminary result exponent (output of 206), set the preliminary result exponent to a first exponent value if the result is within the first range of values, and set the preliminary result exponent to a second exponent value if the result

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is within the second range of values (208). Therefore, it would have been obvious to a person having ordinary skill in the art the time the invention is made to include a exponent processing section for set the preliminary result exponent to a first exponent value if the result is within the first range of values, and set the preliminary result exponent to a second exponent value if the result is within the second range of values in Hirose' invention because it would enable to minimized the error of overflow and underflow.

Re claim 11, Hirose does not disclose combination of the first mantissa and exponent values represents zero, and wherein the combination of the second mantissa and exponent values represents the minimum normalized floating-point number, a_{min} . However, Hirose does not limit the combination of mantissa and exponent to any value in the specification. Therefore, it would have been obvious to a person having ordinary skill in the art the time the invention is made to have the combination of the first mantissa and exponent values represents zero, and wherein the combination of the second mantissa and exponent values represents the minimum normalized floating-point number, a_{min} because they would enable compute the round-off of two operands easily.

Re claim 12, it has the same limitations in the claim 5. Thus, claim 12 is also rejected under the same rationale in the rejected claim 5.

Re claim 13, it has broader claims in claim 9. In specific, the same limitations in claim 9 meet all the limitations in claim 13. Thus, claim 13, is also rejected under the same rationale in the rejected claim 9.

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Re claim 14, it has the same limitations in claim 2. Thus, claim 14 is also rejected under the same rationale in the rejected claim 2.

Re claim 15, it has the same limitations in claim 5. Thus, claim 15 is also rejected under the same rationale in the rejected claim 5.

Re claim 25, it is the method claim of claim 11. Thus, claim 25 is also rejected under the same rationale in the rejected claim 11.

Allowable Subject Matter

9. Claims 3-4, 16-19, 21, 26, and 29 are allowed.
10. Claim 10 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

11. Applicant's arguments filed 6/23/2003 have been fully considered but they are not persuasive.
 - a. The applicant argues in page 16 for claim 1 that the prior art does not disclose that the preliminary result falls within one of a plurality of ranges of values between zero and a minimum normalized floating-point number and set the preliminary result to one of a plurality of set values if it falls within one of a plurality of ranges of values.

The applicant respectfully submits that the prior art discloses the above limitations in Figure 4a wherein the round to nearest even mode is applied. After

the result of an operation is obtain, it would check to see if it should either round-off (round-down) or round-up depending on the last 4 bits (LSB, guard bit, round bit, and sticky bit).

- b. The applicant argues in page 17 that Hirose does not describe nor suggest “determination of whether the preliminary result falls within one of the ranges can be performed by checking an exponent of the preliminary result”.

The applicant respectfully submits that it is well known in the art that a number consists of a sign bit, exponent bits, and mantissa bits. In order to compare one number with the others, it should compare both the exponent portion and the mantissa portion unless both exponent portions are the same, then it only needs to compare the mantissa portion.

- c. The applicant argues in page 19 for claim 9 that First, Mansingh does not describe nor suggest determination of whether “a result of a floating-point operation, comprised of a mantissa and an exponent, is within a first range of values between zero and a minimum normalized floating-point number.” Second, Mansingh does not disclose “set the preliminary result exponent to a first exponent value if the result is within the first range, and result mantissa to a first mantissa.

The applicant respectfully submits that Mansingh clearly discloses the operation is in floating-point as cited in the abstract. In addition, Mansingh discloses in Figure 3A a comparison of exponents (206 and 216) to either shift left or right to achieve a final result based on the claim language.

Conclusion

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chat C. Do whose telephone number is (703) 305-5655. The examiner can normally be reached on M => F from 7:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chaki Kakali can be reached on (703) 305-9662. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-7239 for regular communications and (703) 746-7238 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

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Chat C. Do
Examiner
Art Unit 2124

August 14, 2003

A handwritten signature in black ink, appearing to read 'Chuong Dinh Ngo', written in a cursive style.

**CHUONG DINH NGO
PRIMARY EXAMINER**